Commentary I
The bibliographic "impact factor", the total number of citations and related bibliometric indicators: the need to focus on journals of public health and preventive medicine

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How many of the questions taken on and criteria used by Decker, Beutel and Brähler (2004) in the accompanying paper apply specifically to journals of epidemiology, public health and preventive medicine? While we believe that many do, we also think that some answers – and a number of other important, practical considerations – differ significantly if the focus is on that set of journals, if it is on core publications of other disciplines or if we analyse a larger set of scientific journals (Porta 1993; 1996; Porta et al. 2003). Of course, what journals will it be appropriate to analyse greatly depends on the aims of the analysis (e.g., the assessment of the scientific production of a whole country, a multidisciplinary university or a research department).

The need to undertake different assessments for different scientific and professional areas has long been recognised (Porta 1996; Porta et al. 2003; Garfield 1972). Unfortunately, few analyses are available for scientific journals of preventive medicine and public health. Table 1 shows three bibliometric indicators – among several available – for 25 such journals included in the Journal Citation Reports (JCR) of the Institute for Scientific Information (ISI). It is important to note that the table provides information from both the "Science edition" (often called Science Citation Index, SCI) and the "Social Sciences edition" of JCR. The Science edition covers some 5 700 journals from the ISI database "in disciplines from agriculture to zoology" (ISI). The Social Sciences edition covers about 1700 journals from the ISI database "in disciplines from anthropology to women's studies" (ISI). Most journals included in Table 1 – but not all – are classified by ISI under the section "Environmental, occupational and public health" (current name in the two editions). In this area, some journals are included in both the Science and the Social Sciences editions, but most journals are included in just one edition. Furthermore, within a given edition a journal is often classified in more than one subject area (for instance, in public health and in toxicology, or in public health and oncology). Right or wrong (actually, both), by far the most frequently used ranking of journals of public health is that of the Science edition. This entails that important journals in public health that appear only in the Social Sciences edition are overlooked. Some of such journals have high values in several bibliometric indexes and, when journals from the two editions are combined, they appear in the upper positions. An example is *Social Science & Medicine,* which, with over 9 000 citations, ranked 5th according to this variable in 2001. In that year – latest for which JCR figures are available at the time of writing this paper – the other top journals by total number of citations (all over 10 000) were: *American Journal of Epidemiology (AJE), American Journal of Public Health, Water Resources Research,* and *Environmental Health Perspectives.* Ranking "only" 11th and 14th, respectively, according to total number of citations we find *Cancer Epidemiology, Biomarkers & Prevention,* and *Epidemiology,* whose bibliographic impact factors (BIFs) of 3.97 and 3.36, however, put them in places 1st and 3rd resp. in the ranking by BIF (among one hundred journals of public health).

A related issue is that if – instead of focusing only on the BIF – we use other complementary bibliometric indicators, such as the total number of citations, then other scientifically important and relevant journals have a higher "profile"; this

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Table 1 Three bibliometric indicators for 25 journals of public health and preventive medicine included in the Journal Citation Reports (Science edition and Social Sciences edition), Institute for Scientific Information, The Thomson Corporation*

Journal	2001 Citations	BIF	SI	2000 Citations	BIF	SI	1999 Citations	BIF	SI	1995 Citations	BIF	SI
American Journal of Epidemiology	19 295	3.948	282	18 191	3.870	263	18 203	3.978	275	13 315	3.712	259
American Journal of Public Health	14 012	3.034	312	14 167	3.269	265	13 637	3.015	271	9 349	2.775	248
Water Resources Research	12 885	1.757	284	12 051	1.640	314	12 511	2.061	339	7 888	1.536	271
Environmental Health Perspectives	10 483	3.137	307	9 671	3.033	328	7 934	2.469	279	4 417	1.194	244
Social Science & Medicine	9 193	1.840	274	8 721	1.691	277	8 037	1.468	273	5 075	1.117	322
American Journal of Tropical Medicine & Hygiene	8 054	2.126	222	7 172	1.765	82	7 435	1.932	341	5 077	1.822	231
Medical Care	7 336	2.552	129	7 404	2.535	138	6 954	2.079	177	4 400	2.418	155
Journal of Clinical Epidemiology	5 787	2.039	170	5 127	2.075	158	4 804	2.062	151	2 364	1.280	165
International Journal of Epidemiology	5 533	1.899	139	5 216	1.892	149	4 832	1.974	178	3 051	1.000	178
Transactions of the Royal Society of Tropical Medicine & Hygiene	5 444	1.693	153	4 869	1.485	177	5 473	1.781	194	4 212	1.149	215
Cancer Epidemiology, Biomarkers & Prevention	4 877	3.966	195	4 149	4.354	198	3 290	3.572	150	810	2.705	130
Statistics in Medicine	4 632	1.414	259	4 088	1.717	231	3 703	1.480	228	2 043	1.804	191
Bulletin of the World Health Organization	4 152	2.755	139	3 733	1.937	139	3 620	1.490	96	3 012	1.535	71
Epidemiology	3 639	3.359	96	3 232	3.632	114	2 680	3.377	117	954	2.167	109
Preventive Medicine	3 403	1.552	149	3 316	1.557	163	2 993	1.631	172	1 836	1.403	89
Journal of Epidemiology & Community Health	3 316	2.073	160	3 040	1.827	147	2 810	1.698	128	1 762	1.357	135
Infection Control & Hospital Epidemiology	3 150	2.620	109	2 680	2.082	129	2 606	2.278	134	1 303	1.893	99
American Journal of Industrial Medicine	3 148	1.305	133	3 004	1.277	137	2 822	1.368	201	1 818	0.987	135
Journal of Occupational & Environmental Medicine/Journal of Occupational Medicine	3 050	1.452	61	2 994	1.251	128	2 964	1.477	135	19	0.429	117
Epidemiology & Infection / The Journal of Hygiene	2 884	1.462	102	2 477	1.775	101	2 164	1.911	113	1 381	1.512	108
Cancer Causes & Control	2 722	2.643	109	2 181	2.464	113	2 171	3.044	69	901	2.528	65
Journal of Hospital Infection	2 690	1.983	166	2 159	1.812	132	2 282	2.234	158	1 283	1.307	156
Journal of Health & Social Behavior	2 654	1.911		2 803	2.490	28	2 694	2.540	28	25	2.412	35
Scandinavian Journal of Work, Environment & Health	2 618	1.590	46	2 500	1.574	65	2 479	1.756	112	1 723	1.337	56
Environmental Research	2 462	1.607	83	2 691	1.845	88	2 223	1.617	108	2 021	1.217	23

* Table 1 shows the 25 journals with the highest total number of citations received in 2001

Citations: Total number of citations received in a given year shown; e.g., total number of citations received in 2001 to papers published any time

BIF: Bibliographic impact factor: Number of citations received in a given year to papers published the previous two years, divided by the source items (SI) in the previous two years; e.g., the BIF of 2001 is the result of dividing: a) the number of citations received by journal J in 2001 (i.e., from articles published in 2001 by all citing journals) to papers published by J in 1999 and 2000, by b) the number of SI published by J in 1999 and 2000

SI: Source items: The denominator of the BIF; the number of "items" (articles) published by J in 1999 and 2000; in fact, each year and for each of the thousands of journals that its databases include, the Institute for Scientific Information (ISI, the producers of the Journal Citation Reports and related products) chooses which are the SI among the scientific articles and all sorts of other items published. ISI's counts on SI have occasionally been deemed unaccountable (Joseph 2003)

is the case, for instance, of *Medical Care, Statistics in Medicine* or *Preventive Medicine.*

An interesting point can also be made a propos the *Journal of Toxicology and Environmental Health – Part B – Critical Reviews* (JTEH-B-CR). It published only 11 and nine articles in 1999 and 2000, and it got just a total of 179 citations in 2001 (i.e., less than 1% of those received by the AJE). And yet, JTEH-B-CR was the journal with *the highest* BIF (5.632) in the 2001 JCR... Yes, top journal in the "Environmental, occupational and public health" section. In 2000, the BIF of JTEH-B-CR was 2.36, ranking 10th in both the public health and the toxicology sections (SCI JCR). This journal may symbolise the generally high BIFs enjoyed by journals that publish reviews, and by journals that are often used by researchers in basic biological sciences. But its high BIF must also reflect other important processes, such as the emergence of environmental and genetic toxicology, and the high scientific quality, value and use – or was it relevance? (Porta 1996) – of the articles it accepts.

Specific properties and problems of ISI's BIF have repeatedly been noted by a number of authors, including the creator of BIF, Eugene Garfield (Garfield 1972; ISI; Seglen 1991; 1992; 1997; Moed & van Leeuwen 1995). Several of such issues have to do with the numerator and the denominator of BIF. Concerning the latter, in public health the period of two years is particularly problematic, since the timing of research (and of the uses of research publications, and, hence of their potential overall *impact*) is different than in, say, molecular biology (Porta et al. 2003). Thus, for a journal J a more suitable bibliometric indicator may be the total number of citations received by J in a given year – i.e., total number of citations to papers published by J not just in the previous two years, but to papers it published anytime, or in the previous five or 10 years. The total number of citations also overcomes another problem of BIF: the choice (each year made by ISI's staff) of "source items" (e.g., articles) published by J (the denominator of BIF). Such choice is often a problem: first, because inclusion and exclusion criteria to count "source items" do not seem to be consistently applied to all journals, nor over the years; and second, because citations received by a journal and counted in the numerator of BIF are not necessarily to source items. This might not be a significant problem when a huge number of publications are counted (e.g., when entire countries or institutions are compared). However, if the actual counting of source items is inconsistent for different journals, a significant bias is to be expected when the "impact" or other measures of (bibliographic) "performance", "use" or "value" (Porta 1996) are used to compare journals, as nowadays is so often done. The remarkable findings recently made by Joseph (2003) on the number of source items attributed by ISI to *The Lancet* and to *JAMA* support the idea that such "details" on the quality of BIF do matter (Joseph 2003; Porta 2003).

In addition, ISI's figures are not devoid of the most vulgar, down-to-earth errors (Porta 1993; 1996). For instance, in 1999 the number of source items for *Epidemiologic Reviews* was reportedly 7. Being regular users (actually, *readers*) of this journal, we were surprised; a simple check through PubMed clarified that the number of papers published by *Epidemiologic Reviews* in 1999 was 17. If 7 was used instead of 17 to compute the BIF for 2001 (along with the 36 source items of 2000), such BIF was overestimated. Obvious as the condition is, it goes occasionally unnoticed: only the actual reading of a paper enables us to assess its scientific, public health, sanitary, clinical, social or biological relevance.

Table 2 shows correlations among selected bibliometric indicators for one hundred journals in environmental, occupational

Table 2 Correlations among bibliometric indicators for 100 top journals of public health and preventive medicine

Correlation between...	**BIF 2001**	**BIF 2001**	**No. of source items in 1999 & 2000**	**BIF 2001**	**BIF 2001**
and...	**No. of source items in 1999 & 2000**	**No. of citations received in 2001**	**No. of citations received in 2001**	**Total no. of citations received in 2001**	**Total no. of citations received in 1999 & 2000**
to papers published...	**–**	**in 1999 & 2000**	**in 1999 & 2000**	**anytime**	**anytime**
	1	**2**	**3**	**4**	**5**
All journals (n = 100)	0.510*	0.808*	0.869*	0.800*	0.763*
Journals ranked** 100th to 61st	0.219*	0.475*	0.836*	0.641*	0.592*
Journals ranked** 60th to 31st	0.455*	0.623*	0.889*	0.435*	0.396*
Journals ranked** 30th to 1st	0.114	0.364*	0.931*	0.243	0.206

All figures are Spearman's correlation coefficient
* $p < 0.05$
** Ranked according to BIF in 2001

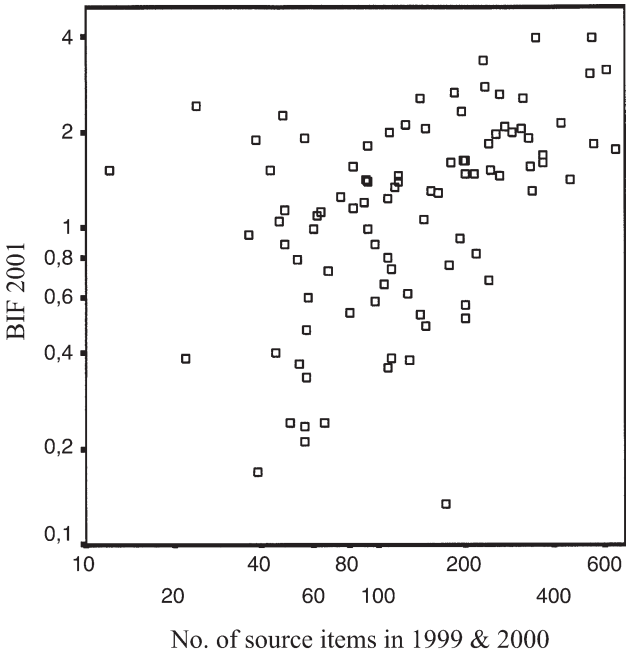

Figure 1 Correlation between the bibliographic impact factor (BIF) in 2001 and the number of Source Items in 1999 & 2000 (all 100 top journals)

and public health. Interestingly, the coefficients vary according to the ranking of journals. Thus, among journals ranked in the top 30 positions there is practically no correlation between the 2001 BIF and the number of source items in 1999 and 2000. If we look at Figure 1, we may identify six journals in the upper left corner: they published a small number of articles and their BIF was high. Such journals are the *Annual Review of Public Health, Epidemiologic Reviews, Journal of Health and Social Behavior, Milbank Quarterly, Population Bulletin* and *WHO Technical Report Series.* On the other hand, the journal in the lower right corner is an example of a journal whose BIF might be deemed "lower than expected" according to the number of articles it published.

Column 2 of Table 2 summarises results of the correlation analysis between what may be deemed *the* two qualities – or maybe just two of the *bibliometric qualities* – that a journal reader (and perhaps a contributor) may seek: many citations and a high BIF. But, of course, there are several other important considerations to keep in mind; including, for instance, the number of review papers published, their scientific quality, or their relevance.

The present brief overview suggests that an assessment of ISI's figures from "within" (or with a focus on) epidemiology, public health and preventive medicine: *a)* it could help unveil errors or inappropriate decisions on the part of ISI; *b)* it could allow more valid and "finely tuned" comparisons among journals; and *c)* it should be compatible with a wider perspective on the bibliometric performance of other relevant journals in the health and life sciences. There is plenty of interesting and relevant work ahead.

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